UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

NOVEMBER 1948

EROSION CONTROL PRACTICES DIVISION

History Repeats on Geneva Corn Yields - E. A. Carleton, Geneva, New York.-"Yields of field corn on the control plots have been determined. This is the second year that these plots have been in this crop. The fertilizer application has been the same both years -- 10-10-10 applied at the rate of 1,000 pounds per acre per year. Rainfall during the growing season of 1948 was 15 inches compared with 20 inches for 1947. An average of the corn yields for the two years would indicate that, for this soil and this crop, fertilizer was only 50% efficient on severely eroded soil (20 tons soil loss per year), and 70% efficient with moderate erosion (7 tons soil loss per year). Yield data and erosion losses are given in the following table:

Fertilizer efficiency during the years 1947 and 1948 at Geneva, New York, in relation to past erosion and soil management; Ontario sandy clay loam.

Management, 1936-1947	Total soil loss 1936-1947, tons an acre	Corn yields,[2] bushels an acre	
		1947	1948
Fallow continuously	215.0	62.2	40.3
Winter rye, summer fallow	84.1	72.5	67.5
Soybeans fall plowed	11.2	94.9	81.6
Soybeans sown in trash	18.5	94.3	96.1
Buckwheat sown in trash[1]	14.4	97.2	105.8
Bluegrass continuously	0.1	100.4	93.1

1/Buckwheat was very weedy.
2/Fertilized with 1,000 pounds an acre 10-10-10 in 1947 and again in 1948.

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Good Surface or Internal Drainage a Must for Vineyards - E. A. Carleton, Geneva, New York.-"Grape yields at the Madison farm in Steuben County showed no significant difference for fertilizer treatments. Surface drainage had more effect on vine condition than any other factor. On the imperfectly drained Mardin soil, 44% of the vines were winter killed, and 89% of these were in areas where there was surface ponding in the rows.

"On the poorly-drained Fremont soil, 25% of the vines were winter killed, and 85% of these were in ponded areas.

"These results indicate that on such soils where internal drainage is slow, each grape row should have an effective drainage grade. In order to avoid sharp curves, some land levelling before planting may be necessary. Such soils frequently have old back-furrows and dead-furrows up and down slope."

Production on Grazing-Runoff Plots Greatly Increased by Nitrogen Applications - C. A. Van Doren, Urbana, Illinois.-"The series of grazing-runoff plots in the soil treatment and grazing management study produced the largest amount of forage for sheep production in 1948 that has been produced on the plots since establishment in 1939. These plots were beginning to be infested with weeds, particularly broom sedge. The treated plots received limestone and phosphate originally and periodic applications of super-phosphate since 1939. A fertilization program was initiated in the spring of 1948 to determine its effect on composition and yield of forage. The treated plots received 8-8-8 fertilizer at a rate of 1000 pounds per acre. Both treated and untreated plots have received ammonium sulphate at the rate of 150 pounds per acre after each four to six week grazing period. The results of this fertilization were remarkable in 1948. Treated plots in this study with moderate grazing previously averaged 185 pounds per acre of mutton. In 1948 these plots produced 484 pounds per acre. Comparable increases were obtained on all other plots regardless of treatment. It is too early to determine the ultimate effect of this program on weed population.

The 1948 results were as follows:

	Treated		Untreated (1)	
	Severe Grazing	Moderate Grazing	Severe Grazing	Moderate Grazing
Sheep gains, lbs./A., 1948	100	484	220	308
Sheep days, 1948	2577	1548	1302	1074
Sheep gains, lbs./A., Average 1939-47	49	185	29	82

(1) Untreated except for nitrogen applied in 1948.

Yields of Corn and Soybeans Increased by Contour Culture - "Corn planted on the contour yielded 7.6 bushels per acre more than corn planted up and down the slope. Contoured soybeans yielded 2.7 bushels per acre more than non-contoured beans. Yields of grain harvested from the plots were as follows:

	Non-contour	Contour	Yield increase for contouring
Corn	134.2 bu./A.	141.8 bu./A.	7.6 bu./A.
Soybeans	29.4 "	32.1 "	2.7 "

Rainfall. October 1.66". November 2.40".

The Influence of Crop Rotation on Soil and Water Losses and on Tomato Yields - O. R. Neal, New Brunswick, New Jersey.-

Treatment	Average annual soil & water loss under tomatoes		1948 tomato yield
	Lbs./A.	Sur. In.	T./A.
3-yr. rotation of cultivated crops, no winter cover	4910	4.83	11.9
3-yr. rotation- 2 cultivated crops, 1 yr. clover & timothy sod	2270	2.32	15.7
3-yr. rotation - cultivated crops with winter cover crops plus compost application	1860	2.31	14.6
3-yr. rotation- year of clover timothy sod plus winter cover and compost	1510	1.55	18.0

"From both the conservation and the yield standpoint, the above results are quite similar to those with sweet corn. The better rotations reduced soil and water losses and increased yields markedly.

"It is interesting to conjecture concerning the economics of crop production under the first and the last rotations listed above. Sweet corn yields in 1948 from these same rotations were 4940 and 10710 ears per acre respectively. If an area of 3 acres, for example, had been continuously cultivated and was cropped half to sweet corn and half in tomatoes in 1948, the total production would have been 7410 ears of corn and 17.8 tons of tomatoes. If the same area had been operated under the last rotation system and was cropped in 1948 to one acre of sod, one of corn, and one of tomatoes the total production would have been 10710 ears of corn and 18.0 tons of tomatoes. The gross return from two acres under the latter rotation would have exceeded that from three acres under the first system of management. Since production costs were less the net return should have been much increased. Accompanying all this, the soil and water losses under the better rotation would have been much lower."

Differences in Soil and Water Losses Between Two Seasons Having Equal Total Rainfall - George W. Hood, Batesville, Arkansas.-"The results of the soil and water losses have been tabulated for the different practices, for the growing season of 1948. These results are found in the following two tables. Along with the total loss of soil and water for 1948, the totals for the previous year of 1947 are also recorded. Some interesting comparisons are found.

Table 1.--Soil Loss in Tons During the Growing Season (April thru September)
1948

Month	Total Rain for Period Produc. Runoff	Cont. Cotton with Slope 90' R.	Cont. Cotton on Contour	Cotton in Rotation on Contour	Corn in Rotation on Contour	Oats in Rotation on Contour	Bermuda Grass	Cont. Cotton with Slope 200' R.	Strip Crop in Rotation on Contour
			Baxter Soil					Ozark Soil	
April	.81	.48	0	0	.10	.09	0	.78	.04
May	3.41	5.44	2.39	1.31	3.70	.72	0	13.03	1.74
June	4.28	5.82	3.91	2.38	.77	.32	0	15.73	1.08
July	1.18	1.17	0	0	0	0	0	.75	.14
Aug.	1.35	.60	0	0	.41	.21	0	.88	.20
Sept.	1.05	0	0	0	0	0	0	0	0
Total	11.93	12.97	6.30	3.69	4.98	1.41	0	31.17	3.20
1947 Total	11.85	4.15	2.52	1.72	1.38	.87	0	10.67	.56
8 Yr. Ave.		18.05	7.6	4.32	4.93	2.53	0	33.30	2.90

Table 2.--Water loss in inches during the growing season (April thru September)
1948

April	.81	.16	.02	.04	.08	.30	.01	.26	.05
May	3.41	1.43	.91	1.17	1.59	1.63	.05	1.44	.59
June	4.28	1.44	1.52	1.51	.93	1.29	.08	1.07	.04
July	1.18	.62	.11	.06	.11	.51	.01	.38	.03
Aug.	1.20	.38	.03	0	.13	.11	.02	.77	.02
Sept.	1.05	0	0	0	0	0	0	0	0
Total	11.93	4.03	2.70	2.78	2.84	3.86	.17	3.02	.72
1947 Total	11.85	2.46	1.21	1.33	1.35	3.61	.08	2.21	.62
8 Yr. Ave.		6.27	3.40	3.44	3.67	6.03	.99	5.22	1.61

"The total rainfall which produced runoff for the two years was almost identical, being 11.93 inches for 1948 and 11.8 inches for 1947. That is about all that is alike.

"Almost without exception, the loss of soil was about three times greater in 1948 than it was in 1947 for most practices; one exception being strip cropping--where it was almost six times greater in 1948 than it was in 1947; while on cotton grown in rotation on the contour it was about two times greater in 1948 than in 1947.

"The difference in the loss of water was also greater, but in general amounted to about twice as much in 1948 as it did in 1947. There are some exceptions here also, with the least difference being found on the strip crop plots where the total was almost the same; with .72 of an inch of water lost in 1948 and only .62 of an inch lost in 1947. The water loss was, for all practical purposes, the same, but in one year it carved off 6 times more soil than it did the previous year.

"Some of these differences might be explained by the intensities of the rain and the time it fell, but whatever the causes were, it emphasizes the folly of recommending farm practices for agricultural improvement on short time records of two or three years."

Nitrate Release During Decomposition of Alfalfa-Bromegrass - Roy C. Dawson, College Park, Maryland.-"On October 20-23 the alfalfa-bromegrass plots were sampled for nitrate determinations at 1-foot intervals to a depth of 5 feet. These plots were maintained on the Soil Conservation Service Research tract at the Beltsville Research Center by Mr. C. S. Britt for the purpose of finding relationships between soil nitrogen and yield and quality of tobacco. The tobacco was grown on ridges and samples were taken from the ridges. Throughout the growing period the nitrate nitrogen content of soils obtained from plots growing tobacco was reduced to a very low value. Shortly before harvest the 1st and 2nd foot of soil in plots growing tobacco contained only 0.89 and 3.03 ppm. (parts per million) of nitrate nitrogen respectively, as shown in the following table. Similar plots maintained free of vegetation contained 6.79 and 10.80 ppm. of nitrate nitrogen in the 1st and 2nd foot depths.

"About 1-1/2 months after removal of the tobacco crop the nitrate nitrogen content of the top foot of soil on which tobacco had been grown increased from 0.89 to 2.87 ppm.

Nitrate nitrogen (ppm.) in ridge rows of plots with and without tobacco before and after harvest of the tobacco.

Depth	With Tobacco	Without Tobacco
	Before Harvest of Tobacco	
1st foot	0.89	6.79
2nd foot	3.03	10.80
	1-1/2 Months after Harvest of Tobacco	
1st foot	2.87	7.38
2nd foot	1.78	6.10

Yields of Crops on Severely and Moderately Eroded Soil - Orville E. Hays, LaCrosse, Wisconsin.-"It was expected that during periods of low rainfall, when moisture is the limiting factor in crop production, that the greatest difference in crop yields would occur. This year's yield data would not support this assumption, as shown by the following data.

Degree of Erosion	Crop Yield Corn bu/A	Oats bu/A	Hay T/A
Severe (3" surface soil)	74	65	3.5
Moderate (6" surface soil)	70	109	2.9

"These data show that a severely eroded Fayette silt loam can be made as productive of corn and hay as a moderately eroded soil. However, as yet, yields of grain are greatly influenced by degree of erosion. The treatment begun in 1939 included the application of fertilizer at the time of seeding grain to provide 75 pounds of available phosphorus and 200 pounds of available potassium per acre, a 5-year rotation including three years of alfalfa brome hay, and low amounts of runoff and erosion."

Volume Weight of Surface Soil in Relation to Type of Tillage - C. L. Englehorn, Fargo, North Dakota.-"The weight per cubic foot of the surface soil has been affected to some extent by the type of spring tillage employed in seedbed preparation under continuous cropping to wheat at Edgeley, according to the data presented in the tables which follow. This was determined incidentally by means of samples obtained for organic matter studies.

"The samples were taken at depths of from 0 to 3 and from 3 to 6 inches by means of a sampling tube of 1-3/4 inches diameter. Samples were obtained in the fall after harvest. Four samples from each plot, or twelve from each tillage practice were obtained. The types of tillage which had been used included; 1, moldboard plowing; 2, stubble mulch tillage; 3, stubble mulch tillage after addition of 2 tons of straw per acre; 4, tillage with the field cultivator; 5, double disking; and 6, burning of crop residues and seeding without any tillage. Immediately after tillage all but the burned plots were packed with a treader and seeded to wheat with a press drill. Plowing was to a depth of 5 inches, stubble mulch and field cultivator to 4 inches and disking to 3 inches in depth.

"Statistically the difference in weight per cubic foot as between the types of tillage used are highly significant. For the 0-3 inch depth a difference of 3.4 pounds and for the 3-6 inch depth a difference of 6.3 pounds is significant. Thus, as would be expected, the soil from the burned, untilled area had the highest weight per cubic foot or, in other words, showed the greatest degree of compaction. To a depth of 3 inches the soil was equally heavy on the disked plot; at 3 to 6 inches the weight per cubic foot was greatest on the disked area.

"Plowing and stubble mulch tillage resulted in essentially equal weight per cubic foot, in either case significantly lower than the weight of the soil from the plots that were burned, disked, or tilled with the field cultivator.

Weight per cubic foot of the surface soil as affected by the type of tillage used in seedbed preparation under continuous wheat at Edgeley, 1948

Tillage Method	Pounds per Cubic Foot of Soil								
	0-3 inches				3-6 inches				Mean 0-6"
	1	2	3	Mean	1	2	3	Mean	
Plow	61.6	63.9	57.7	61.1	67.3	70.7	63.5	67.2	64.2
Burn, no tillage	67.3	71.6	69.8	69.6	72.0	76.7	69.1	72.6	71.1
2-Ton straw, stubble mulch	62.0	67.7	60.4	63.4	63.5	70.9	67.9	67.4	65.4
Stubble mulch	61.8	63.2	58.4	61.1	67.8	65.5	72.3	68.5	64.8
Field Cultivator	67.9	67.0	63.9	66.3	75.2	69.5	70.3	71.7	69.0
Disk	67.5	73.7	64.5	68.6	77.4	77.9	74.0	76.4	72.5

The Effect of Mowing Second Year Growth Sweet Clover on Total Production and Soil Moisture - G. M. Horner, Pullman, Washington.-

Height of clover when cut	Date cut	Yield of Clover			Soil Moisture Content**			
		First cutting	Re-growth*	Total	First foot	Second foot	Third foot	Average 1-3 ft.
(inches)		lbs/A	lbs/A	lbs/A	%	%	%	%
18	5/28	1260	3050	4310	12.96	16.05	15.77	14.93
30	6/4	2480	1700	4180	14.09	18.41	19.38	17.29
42	6/8	3060	860	3860	15.31	21.05	21.97	19.44
60	6/22	4500	none	4500	17.49	22.13	233.38	21.00

* Regrowth cut July 21
** Samples taken July 22

"The maximum production was obtained when the clover was allowed to grow to the bud stage (60" high) before cutting. Mowing at the 18" and 30" heights slightly reduced the total yield of dry material, but the stems were much smaller and the soil moisture content was greatly reduced. Both of these factors are important from the standpoint of soil conservation. The lower soil moisture content permits storage of a larger portion of the following winter's precipitation. A finer texture of the clover

facilitates the use of mulching operations to provide a surface cover. Previous work on the utilization of sweet clover as a mulch indicated that seedbed preparation for winter wheat was too costly when the clover was allowed to grow to the bud stage without any clipping treatment. The development of a clipping operation should aid in the application of the clover mulch practice in the Palouse."

Earthworm Activity in Relation to Intake of Water by Soil - Henry Hopp, Beltsville, Maryland.-"N. L. Stoltenberg recently wrote us about an article he published eight years ago that confirms our recent findings on the importance of earthworms to the intake of water by soil. This article has apparently been overlooked by most soil scientists interested in the problem on infiltration. In order to call the attention of other SCS research workers to the highly important implications of these findings, we are taking the liberty of citing some of them in this Monthly Summary.

"The first table shows how the larger holes in the soil are primarily effective in transmitting water:

Pore space filled with water at maximum water-holding capacity, that is occupied by air after drainage of gravitational water (% of total pore space)	Field infiltration rate (Surface inches per hour, 42 to 48 hours)
0.0	0.01
0.0	0.01
6.4	0.05
8.2	0.39
8.4	0.98

"Here you see that infiltration rate follows closely the large, readily-drainable pores in the soil.

"Another table shows an increase in infiltration rate associated with the activity of earthworms. The infiltration test was run on meadowland and followed Musgrave's procedure. In an initial run, the infiltration was obtained between the 46th and 48th hour of the run. Then the soil was covered and kept moist by frequent additions of water for 41 days. During this time, the earthworms in the soil had a chance to be active. At the end of the 41 days, the infiltration rate was again determined for a 10-hour period. The cylinders of soil were then excavated and the earthworms counted. Results were as follows:

Soil Cylinder Designation	Infiltration rate, surface in./hr.		Earthworms in cylinders	
	At end of initial run	41 days later (10 hour run)	Large	Small
16	3.24	7.10	2	23
15	0.84	2.46	1	20
27	0.46	1.56	1	21
11	0.12	2.21	0	38
25	0.04	0.16	1	9
22	0.01	0.00	0	0

"The data show that an increase in infiltration rate after the 41 days occurred where earthworms were present, and the increase was in proportion to the earthworm population.

"The reference for this article is "Some Factors Which Influence Infiltration and its Measurement in Houston Black Clay," C. W. Lauritzen and Norval L. Stoltenberg. Jour. Agron. 32: 853-866. 1940."

Sorghum Grain Yield in Relation to Tillage Treatments - A. E. Lowe, Garden City, Kansas.-"The sorghum grain yields on the Basin Project plots were figured and are given in the following table. The yields were very good this year and there are only two other years when the average yield for all plots was higher in the nine years of data. The yields for 1948 are about in line with the nine year averages except the ordinary list up and down slope in 88-inch rows was about twelve bushels high. A difference in weed infestation may be the cause but before harvest the difference did not appear as great as the difference in yield indicates.

"The yield table gives the 1948 grain yields and also the nine year averages. The nine year average of all contour plots is 20.6 bushels per acre whereas the nine year average of all non-contour plots is 17.2 bushels per acre.

"This is an increase of 3.4 bushels per acre or 20 percent for contouring over non-contouring. The nine year average of all basined plots is 19.2 bushels per acre whereas the nine year average of all non-basined plots is 18.6 bushels per acre. This is an increase of only .6 bushels per acre or 3 percent for basining over non-basining, and is probably not significant.

Sorghum grain yields in bushels per acre obtained on the Basin Project plots at Garden City, Kansas in 1948 and an average of the last nine years results.

Cultural Treatment	1948	9 Year Average
44-inch listed rows, continuously cropped (a)		
Basined on contour	22.2	18.6
Ordinary list on contour	16.2	20.8
Basined up and down slope	12.0	14.5
Ordinary list up and down slope	13.5	14.3
88-inch listed rows, continuously cropped (b)		
Basined on contour	27.6	15.2
Ordinary list on contour	25.8	15.3
Basined up and down slope	29.0	14.4
Ordinary list up and down slope	40.2	14.9
44-inch listed rows, on one year fallow (a)		
Basined on contour	48.5	28.8
Ordinary list on contour	46.0	24.8
Basined up and down slope	38.4	23.6
Ordinary list up and down slope	34.9	21.8

(Continued on next page)

Average of the above three groups of treatments		
Basined on contour	32.8	20.9
Ordinary list on contour	29.3	20.3
Basined up and down slope	26.5	17.5
Ordinary list up and down slope	29.5	17.0
Average	29.5	18.9

(a) Changed to 42-inch rows in 1947.
(b) Changed to 84-inch rows in 1947.

Accumulative Effects of Stubble Mulch Tillage - C. J. Whitfield, Amarillo, Texas.-"Analysis of variance of the grain yields on the stubble mulch plots for the past seven years showed:

A. On the continuous wheat plots:
1. No difference between subtilled and plowed plots for the first two years, 1942 and 1943; a significant difference during the next three years, 1944, 1945 and 1946; and a highly significant difference for 1947 and 1948. In other words, the effects of stubble mulch tillage has been accumulative, gathering speed as it goes along this 7-year period.
2. No significant difference between sweep machines, the Noble blade and the modified dempster tiller. As a result the machine that works best under the conditions encountered can be used.
3. No significant difference between the one-way and the moldboard plow.
4. A highly significant difference between the subsurface tillage machines and the plows.
5. Of great importance also is the fact that for the past 7 years on sub-tilled land the average wheat yield was pushed up to 14.5 bushels per acre.

B. On the fallow plots:
1. A significant difference for 1943, 1945 and 1947; a high significance for 1946 but no significance for 1944 and 1948. The trends evidenced on the continuous wheat plots are not to be found in this series.
2. A high degree of significance between stubble mulch tillage and the one-way plot.
3. No significance between sweeps, the modified dempster tiller and the Noble cultivator.
4. No significant difference between early and delayed fallow. This is important in that leaving residue untouched until spring along with weeds and volunteer wheat gives greater soil protection at less cost for materials and labor for additional operations necessary on early fallow."

Effects of Tillage Treatments on Crop and Soil Moisture - Torlief S. Aasheim, Bozeman, Montana.-"A brief summary of the results which have been obtained to date on the cooperative tillage project at the North Montana Branch Station at Havre, Montana are tabulated in the following table:

Bushels of spring wheat and pounds of straw per acre. Test weight and protein content of grain produced and percent moisture per foot of soil at seeding time. North Montana Branch Station, Havre, Montana. Average of six years 1943 through 1948.

Fallow Method		Grain Yield Bushels	Straw Yield Pounds	Test Weight Pounds	Percent Protein	Percent Moisture Per foot
Sub Surface	T	18.6	2404	56.7	16.0	13.1
" "	B	17.6	2404	56.3	16.0	13.2
Average		18.1	2404	56.5	16.0	13.2
Oneway	T	17.7	2378	56.2	16.4	12.5
	B	18.1	2502	56.7	16.5	12.8
Average		17.9	2440	56.5	16.5	12.7
Moldboard Plow	T	17.4	2398	56.4	16.7	12.2
	B	17.7	2503	56.7	16.7	12.8
Average		17.6	2450	56.6	16.7	12.5

	All Unburned	All Burned
Average yield, grain, bu.	17.9	17.8
Average yield straw, lbs.	2393	2469
Average test weight, lbs.	56.4	56.6
Average percent protein	16.4	16.4
Average percent moisture per foot	12.6	12.9

Uphill Plowing Versus Conventional Plowing - Harley A. Daniel, Guthrie, Oklahoma.-"Maurice B. Cox has studied soil movement lines on terraced land that has been tilled by different methods of plowing over an 8-year period. Three terraces on the Cherokee Station have been measured that were tilled with a two-way hillside plow. On this area there was no marked movement of the soil from the interval toward the terraces. However, on the Guthrie Station, where terraced land has been plowed with a conventional plow leaving a dead furrow at different locations in the interval, the surface of the interval was lowered as much as 6 to 8 inches. The dead furrow in the interval was eliminated with the hillside plow, and the channel and ridge readily maintained.

The amount of Vegetative Cover on Uncleared and Cleared Scrubby Oak Land "Harry M. Elwell, who has studied this problem, found that 2,4-D or 2,4,5-T acid controls the brush and allows more grass to grow. Residue from the deadened brush accumulates on the surface soil and protects it from erosion. This residue also provides ideal protection for the growth of the grass seedlings. Native grasses have developed good stands in the course of two years time on areas treated with chemicals. The findings are summed up in the following table:

Amount of Vegetative Cover in November 1948 on Uncleared and Cleared Scrubby Oak Land at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma

Area	Date Treated	Cover, Pounds per acre			Sprouts Per Acre Now Remaining	Increase of Native Grass over Undisturbed scrubby oak
		Native Grasses	Weeds & Annual Grasses	Residue Accumulation		Percent
Undisturbed 1/		645	47	7080	22,244	
Crushed, Marden Brush Cutter	June 1946	1957	517	3991	27,720	203.41
Weedone* (2,4-D) spray 2/	June 1945	3013	233	7593	2,250	367.13
Ammate* (spray) 3/	Sept. 1945	3010	843	3088	1,120	366.67

* Chemicals applied in accordance with manufacturer's recommendations.

1/ Original cover of scrubby oak.
2/ Retreated May 1947.
3/ Retreated with 2,4-D, May, 1948.

Effects of Different Rates of Use of Sheep Pastures - O. K. Barnes, Laramie, Wyoming.-"The following report includes vegetative studies, forage production and grazing results from the rate of use study at Archer. This study, started in 1944 was set up to study the effect on the pasture cover under 3 rates of forage removal by sheep. Blue grama and buffalo grass have been the key species for determining utilization. Each year these species have been grazed until the average leaf height left was 1.05", .80" and .59". Two pastures are used for each of these 3 rates.

"Striking differences in the vegetation have not shown up yet between these 3 rates of forage removal. Protective stubble and plant residue on the heavy rate (.59" left) is almost completely absent each year. The data also indicate that under the heavy rate of removal that:(1) signs of change in vegetative composition appears to be under way in the fifth year; (2) This type of pasture under use by sheep has remarkable resistance to excessive use; (3) the annual gains have not yet reflected any overuse to any appreciable extent; (4) easily identified signs of over use are very slow to appear. 1948 measurements are given in Tables I, II, and III.

Table 1.--"Effect of Different Degrees of Forage Removal on Vegetative Density and Composition on Short Grass Pastures-Readings Made in 1948-Fifth Year of Grazing.

	(2 pastures, Nos. 4 & C) Light Use 1948 % Basal Density	(2 Pastures, Nos. 5 & B) Moderate Use 1948 % Basal Density	(2 pastures, Nos. 6 & A) Heavy Use 1948 % Basal Density
Blue grama and buffalo	15.750	17.000	18.220
Sandberg blue grass	.503	.272	.189
Carex filifalia and stenophylla	.419	.374	.382
Needle and thread grass	.494	.148	.066
Six weeks of Fescue	.214	.317	.233
	1948 Plant counts Per sq. meter	1948 Plant cts. Per sq. meter	1948 Plant cts. Per sq. meter
Western wheat grass	88	102	61
Weeds:			
Annual	11	5	3
Perennial	12	17	7

Table 2.--Effect of Different Degrees of Forage Removal for 3 and 4 Year Periods on Forage Production, Lbs. Per Acre in 1948, Clipped at Ground Level

	Light Use	Moderate Use	Heavy Use
Clipped yield from area grazed 3 years. Cages erected to protect plots in fourth and fifth year (1947 and 1948)			
Blue grama and buffalograss.....	317	262	288
All other perennial grass including Carex.....	195	179	143
Six weeks Fescue.....	10	3	3
Weeds.....	30	13	18
Clipped yield from area grazed 4 years. Cages erected to protect plots in fifth year (1948)			
Blue grama and buffalo grass.....	290	266	311
All otherperennial grass including Carex.....	124	106	120
Six weeks Fescue.....	10	5	1
Weeds.....	24	7	14

Table 3.--Effect of Different Degrees of Forage Removal on Sheep Gains From Short Grass Pastures.

	(2 Pastures Nos. 4 & C) Light Use (1)		(2 Pastures, Nos. 5 & B) Moderate Use (2)		(2 Pastures Nos. 6 & A) Heavy Use (3)	
	4 yr. Ave. 1944-47	1948	4 yr. Ave. 1944-47	1948	4 yr. Ave. 1944-47	1948
Sheep Days Grazing Per Acre	36	28	59	49	86	70
Gain Per Head						
Ewes	24.7 lbs.	25.8	25.7	19.9	15.8	17.2
Lambs	48.3 lbs.	52.4	48.9	46.0	45.3	46.7
Gain Per Acre						
Ewes	8.0 lbs.	7.0	12.8	9.2	10.9	11.3
Lambs	17.4	15.9	27.0	25.0	36.7	35.6

(1) Ave. leaf height left each year on blue grama-buffalo grass 1.05 in.
western wheat 4.64 in.
(2) Ave. leaf height left each year on blue grama-buffalo grass .80 in.
western wheat 3.56 in.
(3) Ave. leaf height left each year on blue grama-buffalo grass .59 in.
western wheat 2.42 in.

"As an incidental comparison of yields shown in Table 2, six plots were clipped on an exclosure of the same type within one of these pastures which has been protected for 10 years. The 1948 yields from the exclosure were as follows:

	Lbs. per Acre - 1948 From Exclosure Protected 10 Years.
Blue grama and buffalo grass	250
All other perennial grass including Carex	259
Perennial weeds	106
Annual weeds	5

"The blue grama and buffalo grass in this exclosure has declined but the other perennial grasses have more than compensated for this decrease. Perennial weeds, principally Artemisia frigida have markedly increased as compared to yields shown in table 2."

Mulch Farming with Corn and Cotton Following Oats and Kobe Lespedeza - T. C. Peele, Clemson, S. C.-"An experiment is being conducted at Clemson in which corn and cotton each follow 1 year of oats and Kobe lespedeza with the oats straw left on the land after the oats are combined. The dead residues from the lespedeza and oats serve as a source of organic matter for the succeeding corn or cotton crop. The effects of conventional clean tillage methods with the corn and cotton are being compared with mulch farming methods.

"The mulch balk tillage method was used in 1947 on the mulch plots. Middlebuster points followed by reversed disk hillers were used to open planting furrows in the mulch plots, and the middles were loosened with middle buster points followed later by cultivation with 24 inch sweeps. The plowed plots were plowed with a moldboard plow, disked, and cultivated with a rotary hoe.

"In 1948, the mulch plots were ripped once with a Graham Hoeme field tiller and rows opened with middle-buster points, reversed disk hillers, and a locally constructed clod breaker attachment mounted on a Ford tractor. The middles were ripped with middle-buster points with moldboards removed. A rotary hoe was used for the initial cultivation and conventional sweeps for subsequent cultivation.

"All plots received 700 lbs. 4-10-6 fertilizer at planting time each year and the corn plots received a side dressing of 64 pounds nitrogen from ammonium nitrate in 1947 and from nitrate of soda in 1948."

"The effects of the tillage methods on yields of cotton are shown in table 1. The yields of cotton following Kobe lespedeza where the clean tillage method was used were significantly higher than the mulch treatment in 1948 indicating the need for further investigation and modification of the mulch practices used with cotton.

"The data in table 2 show that the corn yields from the mulch treatment were equal to those where the clean tillage practices were used.

Table 1.--Influence of tillage methods on yields of cotton

Tillage method	Preceding cover crop	Yield of seed cotton, lbs./acre		
		1947	1948	Average
Mulch	Kobe lespedeza	366	1235	800
Clean	Kobe lespedeza	448	1549	999
Clean	none	227	1286	757
Difference required for significance		307	265	

Table 2.--Influence of tillage methods on yields of corn following oats and Kobe lespedeza

Tillage method	Yield of corn, bu./Acre		
	1947	1948	Average
Mulch	16.5	58.3	37.4
Clean	20.6	56.6	38.6
L S D	9.2	7.7	

Mulch Farming with Corn and Volunteer Crotalaria Spectabilis - "Mulch farming techniques have been compared with clean tillage practices while growing corn with volunteer Crotalaria spectabilis. Corn follows corn each year with residues from the corn and crotalaria serving as a source of mulch for the succeeding corn crop. The yields from corn on the mulch area and the clean cultivated area have been about equal for the past four years. Table 3 shows the yields from these areas for 1945-1948. There are no significant differences between the yields.

Table 3.--Effects of tillage methods on yields of corn following corn and crotalaria spectabilis

Tillage Method	Corn yields in bushels per acre				
	1945	1946	1947	1948	Average
Mulch*	72.2	68.8	27.9	70.1	59.8
Clean	72.3	68.5	26.3	68.3	58.9

* The mulch balk method was used in 1945, the mulch disk method in 1946 and 1947, and in 1948 the only ground preparation consisted of double ripping the mulch plots with the Graham Hoeme field tiller.

Corn Following Winter Cover Crops in Relation to Tillage Methods Affecting Soil and Water Losses - T. C. Peele, Clemson, S. C.-"Three tillage methods with corn were compared where corn is grown each year following vetch and rye or crimson clover. The plots are 1/15 acre in size, located on Cecil sandy loam, with 5 replicates for each tillage method where corn follows vetch and rye and 3 replicates where corn follows crimson clover. Runoff and erosion measurements are made on duplicate plots where corn follows vetch and rye and the following tillage methods are used: mulch balk method, mulch disk method, and plowing followed by clean cultivation. There are two additional runoff plots where corn is grown each year without any winter cover crop.

"This experiment has been conducted for 6 years although there have been some variations in treatments particularly during the first 2 years of the experiment. In 1943 the corn was fertilized at the rate of 450 lbs. of 5-7-5 fertilizer per acre while in 1944 it received 500 lbs of 4-10-6, and in 1945 500 lbs. of 3-9-9 fertilizer per acre. In 1946, '47 and '48 it received 700 lbs. of 4-10-6 fertilizer applied in the drill at planting time. No side applications of nitrogen were made in 1943 and 1944 but the corn received side dressings of 200 lbs. Cal-nitro per acre in 1945, and 64 lbs. of elemental nitrogen in 1946, 1947 and 1948 either in the form of ammonium nitrate or nitrate of soda. The corn variety the first 2 years was Loman's Yellow and in 1945, 1946, 1947 and 1948 it was Funk's Hybrid G-714.

"The effects of the different tillage methods on corn yields are shown in table 1. The tillage methods failed to produce statistically significant differences in yields of corn following winter cover crops in 1943. The yield in 1944, from the mulch balk tillage method was significantly larger than from the plowed clean tillage plots. The yield of the mulch disk plots was not significantly higher than the plowed plots. The disking

operation during the first two years was more thorough and incorporated considerable more organic matter than in subsequent years, with the result that there was less mulch on the disked plots than on the plots receiving the mulch balk treatment in 1943 and 1944. The following year, 1945, there was no significant differences between the yields from the mulch disk method and the plowed method. The yield from the mulch balk method was low in 1945 due to depletion of the stand by bud worms. The cover crop growth in the balks was not killed until planting time that year, instead of the usual practices of killing it two or three weeks before planting, which was done with all the other tillage methods. In 1946 and 1947, there were no significant differences between the yields of the mulch plots and the plowed plots where the corn followed winter cover crops. Corn yields from all plots during 1947 were extremely low, which was due to insufficient rainfall in July and August. The total rainfall for these two months was the lowest in 55 years, according to the Clemson rainfall records. In 1948, the tillage methods did not produce significant differences in corn yields. The average yields for the 6 year period show that approximately the same quantity of corn was produced with the mulch methods as with clean cultivation. (Note: During the three seasons of poor corn yields, the no cover crop plots gave better yields than the cover crop plots; but during the three seasons of good corn yields the cover crop plots gave better yields than the plots without cover crops - Table 1).

Table 1.--Effects of cultural treatments on yields of corn following winter cover crops.

Tillage method	Cover crop	Yield of corn in bu. per acre						
		1943	1944	1945	1946	1947	1948	Average
Mulch, balk method	vetch & rye	26	24	65*	71	22	79	48
Mulch, disk method	vetch & rye	30	22	80	64	21	73	48
Plowed, clean cultivation	vetch & rye	32	19	76	60	21	74	47
Mulch, balk method	crimson clover	28	22	64*	61	21	69	44
Mulch, disk method	crimson clover	33	20	83	57	23	72	48
Plowed, clean cultivation	crimson clover	36	17	82	59	19	70	47
Plowed, clean cultivation	none	40	22	62	54	24	63	44

* Bud worm infestation depleted stands on these plots.

"The effects of the different treatments on runoff and erosion during each of the corn growing seasons in the 6 year period that the experiment has been conducted are shown in tables 2 and 3. The data show that the mulch methods are very effective in reducing runoff and erosion. The average runoff for the mulch balk method was about one-fourth that of the clean tillage plots where vetch and rye were plowed under and about one-sixth the runoff where no cover crops were present. While the erosion from the mulch balk method was approximately one-sixth that of the plowed clean cultivated plots where vetch and rye was turned under and about one-thirteenth the erosion from the clean cultivated plots where no cover crop was grown.

Table 2.--Runoff from corn plots where different tillage methods were used.

Tillage Method	Preceding Cover Crop	Runoff during corn growing season*						
		1943	1944	1945	1946	1947	1948	Average
		%	%	%	%	%	%	%
Mulch, balk	vetch & rye	12.42	0.42	1.65	2.51	0.55	3.31	3.48
Mulch, disk	vetch & rye	18.97	2.38	1.77	4.74	0.80	7.40	6.01
Plowed, clean cultivation	vetch & rye	19.71	6.42	9.55	16.08	2.50	17.52	11.96
Plowed, clean cultivation	none	25.62	15.96	34.65	41.63	10.55	31.41	26.64

* The percent runoff is based on the total rainfall during the storms which produced runoff.

Table 3.--Soil loss from corn plots where different tillage methods were used.

Tillage Method	Preceding Cover Crop	Soil loss during corn growing season, lbs./Ac.						
		1943	1944	1945	1946	1947	1948	Average
Mulch, balk	vetch & rye	1550	45	112	245	none	536	415
Mulch, disk	vetch & rye	5484	377	242	337	none	1251	1282
Plowed, clean cultivation	vetch & rye	9802	488	357	1266	none	2506	2403
Plowed, clean cultivation	none	7915	6006	5777	5100	264	7357	5403

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Mr. Dreibelbis' summary of soil and nitrogen losses on the corn watersheds in 1948 show the effectiveness of contour cultivation in conserving soil and nitrogen (watersheds 106 and 121). These data along with similar values for other corn watersheds are given in the following table:

Soil and nitrogen losses on corn watersheds, 1948

Watershed No.	Land Use	Soil Loss 1/	Nitrogen loss	Losses compared to no conservation: Soil	Nitrogen
		Lbs/acre	Lbs/acre	Percent	Percent
106	Plowed-straight row	45,974	8.223	100	100
121	Plowed-contour	13,600	4.910	29.5	59.5
188	Mulch-contour (2,4-D) 2/	102	.007	.2	.1
191	Plowed-contour (2,4-D) 2/	9,600	1.353	20.8	16.4
185	Strip-cropped (corn-meadow)	86	.011	.2	.1

1/ Corrected for land slope - that of No. 106.
2/ No cultivation.

"The nitrogen losses, converted to the equivalent amount of 2% N fertilizer, are given below:

Watershed No.	2% N fertilizer
106	411 lbs. per acre
121	246
188	.4
191	67.7
185	.6

"Application of fertilizer at corn planting on the two watersheds, Nos. 106 and 121 is as follows:

Watershed No.	Fertilizer applied per acre: Total	Nitrogen	Ratio	Losses
106	200 lbs. of 2-12-6	4 lbs.	1.0	1.0
121	300 lbs. of 2-12-6	6 lbs.	1.5	.6

"There were three storms, June 27-29 in which the nitrogen losses on conservation watershed 106 were higher than on No. 121 by 16 percent. This is the season when most nitrogen is released by the buried legume sod in No. 121. There were no legumes in No. 106."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"On November 18 and 19 a severe storm swept the State which was probably the worst storm since 1888, although the storm on Armistice Day, 1940 was considered to be almost as bad. An estimated 9 inches of snow fell locally, accompanied by a 40 mile an hour north wind. The wind blew all the snow off the wheat fields and other fields of sparse cover, which were on the flat land and on the northern slopes. Hence, very little of the moisture was retained on these fields. The corn stalks offered some protection against blowing. Drifts up to 8 feet deep were not uncommon in protected areas, such as along fence lines, shelter belts and buildings. Highway and rail traffic was almost at a stand-still for 3 days and some of the rural roads were still impassable on the last of November. Several days after the storm the city of Hastings estimated that they had spent $50,000 cleaning the streets, which is about $2 per capita.

"A short article was prepared on corn yields and runoff for 1948 for the watersheds under different land use practices. This article is being cleared by the Nebraska State Experiment Station and it is hoped that it can be printed in the 'Soil Conservation' magazine, after the Washington office clearance has been obtained.

"Total runoff for each watershed was computed for the period April through September. The straight row corn lost an average of 1.6 inches runoff during the 6-month period, while subtilled corn lost 0.8 inch and contoured corn less than one-half inch. Comparative corn yields have previously been submitted."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"Mr. Stoltenberg has been working on a recheck and study of comparative data from a pair of adjacent watersheds (#14 and #15) under the prevailing and conservation treatment, including analyses of a number of hydrographs and development of infiltration rate curves.

"Several interesting observations have been made in this connection:

A. Techniques

1. Pondage corrections for temporary storage above measuring instrument when properly determined and applied to the observed runoff rate data, eliminate many apparent incongruities between the rainfall and runoff rates.

2. The method and accuracy of computing the pondage corrections is very important, small variations in method or incorrect volumetric measurements of the storage reservoir result in important errors in the infiltration rates derived or even obliterate important 'check points' on the curve. For this use of the data, changes in the volume of storage due to siltation or erosion above the measuring station must be carefully accounted for and the time intervals for tabulating of observed runoff rates must not exceed 1 minute for small watersheds (2-3 acres) and may need to be as little as 1/2 minute close to the runoff peaks, to avoid exageration of the pondage component.

B. Results:

We have noted frequent reversals in the relative runoff behavior of watersheds in the same crop, under the same treatment, or even varied treatment. Of the particular watersheds recently studied in detail, it has been demonstrated that the watershed (#14) that has been under the conservation treatment always starts runoff sooner and generally exceeds the total runoff that from its mate under the prevailing treatment in cases where only very low rates of runoff occur; whereas, this situation is reversed whenever higher rates of runoff occur, irrespective of crop or time of year. This has not been greatly affected by the difference in treatment of the watersheds since 1942. The spread between the runoff totals with high rates of runoff has been very materially increased by the treatment during the time that contouring was effective. This supports the contention stated many times in reports from this Station that early and sustained ridging or corrugation of the soil surface during the time row crops are on the land is extremely important to the effectiveness of contour cultivation for runoff control. We believe that seeding and cultivation equipment and methods need modification to this end; also that maximum reduction of runoff requires supplementary practices, e.g., mulch culture, to reduce losses during times when contouring is not effective.

"Subsidence lines were run across privately owned land of the Ghering farms and the Gumz farms. Because of a number of factors these surveys in November of this year are incomplete, but the data from a 5-year period are starting to give indications of the rate of subsidence on these fields. On a field of the Gumz farms, 10 miles southwest of South Bend, Ind., and near the Kankakee River over a period of 5 years, a mean subsidence of 0.116 ft/yr. has been measured. Measurements in this field tend to confirm results on the Purdue Muck Experiment Farm Drainage plots that the rate of subsidence varies directly as the depth of water table from the ground surface. On a field of the Ghering farms near Gifford, Ind., over a period of 5 years a mean subsidence of 0.120 ft/yr. has been measured. Examination of the variations within this field

indicates that subsidence varies directly as the depth of water table below the ground surface, and inversely as the mineral content of the muck; the mineral content of the muck having been increased by burning of a portion of this field.

"Mr. E. R. Baugh, of the Experiment Station Staff, has completed compilation and analyses of yield sample data for replicated plots in corn, soybeans and wheat at Lafayette, and for two sets of plots in corn and 1 set each in oats and hay in Noble County, for the past season, for 8 variations of depth of tillage and location of meadow residues in the preparation of seed beds for corn (studying residual effects of corn treatment on yields of subsequent crops in the rotation). A brief summary of crop yield results from these experiments for the 1947 and 1948 season was prepared. Copies can be supplied on request for in-Service information."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.- "The Project Supervisor was asked to present a discussion of the water resources problems in Virginia before the State Soil Conservation Committee on December 7. In order to obtain fuller information regarding the problems, a conference was held with Dr. William McGill, State Geologist, on November 29. At the time of this conference, the subject of geological formations with relation to farm pond site selection was also discussed. It was planned that a week's field tour of farm pond sites be arranged during the coming spring in order that specific recommendations with regard to geological formations could be made. At this same time, a conference was held with Mr. Donald S. Wallace of the USGS with regard to procedures of analysis in reporting data obtained on the Bell Creek Project. A study of water control laws existing in other States was made in the library of the Civil Engineering Department at VMI. Discussions concerning ground water and surface water problems in Virginia and their relation to the agricultural programs was carried out with Colonel Marr, Head of the Civil Engineering Department."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"On November 2, I attended a conference with the Iowa Agricultural Experiment Station staff and the Army Engineers in Omaha to discuss hydrologic research in the Little Sioux area of Western Iowa. This was followed on the 3rd and 4th by field trips with Dr. Browning, Mr. Norton, both of the Soil Conservation Service, and Mr. Frevert of the Iowa State College staff, to view some of the work under construction on the Little Sioux Flood Control Project and to discuss possibilities and methods to be used for obtaining suitable runoff measurements on certain of these areas. Following this trip I recommended changes in the design of the inlets so that they would be better suited for use as a measuring weir.

"During the period of November 8 to 11, I made a field trip to Western Minnesota with Mr. Larson of the University of Minnesota, Mr. Sturman of the Minnesota Conservation Department and Mr. Fauntz, engineering specialist of the Soil Conservation Service. The purpose of this trip was to determine the type of information desired and the feasibility of establishing runoff studies in the Red River Valley; also an attempt was made to select areas which would be suitable for runoff measurement. No definite commitments were made as to the areas and it was decided that further study would be necessary before selecting the areas to be studied.

"On November 22 and 23, I made a field trip with Mr. Kidder of the Soil Conservation Service, and Professor Hay, Mr. Muirheid and Mr. Lytle of the University of Illinois, for the purpose of looking over the sites which have been proposed for establishment of hydrologic studies on the Allerton Estate farm near Monticello, Ill. This trip was followed by a general discussion of the type of installation and equipment necessary to obtain the required information. The group decided that rainfall and runoff measurements should be established in connection with two small lakes on the 4-H Club area. They also recommended further investigation before selecting areas to determine the effect of various conservation practices on runoff."

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-In reporting the work on farm pond sealing during the month of November, Mr. H. N. Holtan makes the following statements:

"As indicated in last month's report, sedimentation curves were being obtained for various soils in hopes of obtaining a common type equation with varied coefficients, exponents, etc. This equation was of the type--percent settled equals 'a' x time to the nth. exponent minus 'k' ($\% = aT^n - k$).

"Sedimentation curves have been obtained upon 12 soils and pertinent data such as compaction vs. optimum moisture relationship, percolation vs. compaction and thickness of mantle vs. compaction as well as shrinkage data were also obtained. Further study shows that all of these curves do not fit the above type of equation. They could all be handled by using log percent and log T but this is essentially a sloughing off of the forepart of the curve; example: Log 10 equals 1 and Log-log 10 equals 0. As an alternative, simple tabulations from the curve at 1, 2, 5 and 60 minutes were obtained and the totals thereof used as relative indexes (A) of the intercept (or position), slope and shape of the curve. These tabulations and the A index are presented in the following table:

Sedimentation Curves

Soil	Percent Settled at Various Times from Start: 1	2	5	60	A*
Linside L	22	27	35	60	144
Leadvale (m)	19	27	36	60	142
Linside FSL	27	44	54	76	201
Linside L (M)	21	38	60	80	199
Leadvale SL (M)	19	24	31	56	130
Philo FSL (lgt)	45	52	59	76	232
Greendale SL (M)	8	16	29	70	123
" " (lgt)	27	36	48	78	189
" " "	5	9	15	54	83
" " (M)	8	12	19	49	88
Clay P. Mat	18	23	30	54	125
Sandy Loam	31	53	67	83	234

*% settled at 1 min. + % at 2 min. + % at 5 min. + % at 60 min.

"Thus far it has been impossible to detect any relationships between these curves and other available information on these soils. Therefore, it is felt that time out be taken for cogitation. During this time out, it is planned that work in the laboratory be conducted making determinations of bentonite vs. compaction vs. head of water vs. soil. Six-inch tubes can be used in this study since six inches is about the greatest reliable depth of the mixing for bentonite and soil in the field.

"Heretofore, the study has been progressing to more and more basic data. Now it seems that the progress is essentially as far as it can go in this direction without considerable further detailed study. It is hoped that by reverting to the other end of the picture; that is, finding the optimum combinations of bentonite and compaction for various heads on various soils, it will later be possible to derive associations with basic information now at hand."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minn.-"An engineering training conference was held at the laboratory on November 17 and 18. The conference was attended by John W. Ferguson, Extension Soil Conservationist, two Engineering Specialists and three Engineering Aids all from Missouri, and by Mr. A. F. Moratz, head of District Operations Design and Construction, and Mr. D. O. Kearns, Zone Conservationist from the Region III office at Milwaukee. The program began with a brief history of the St. Anthony Falls Hydraulic Laboratory by Dr. Straub and a general description of what the Soil Conservation Service is trying to accomplish here by Mr. Blaisdell. The remainder of the program was largely technical. The theory of hydraulic jumps was explained as an

introduction to a description of different types of energy dissipators that have been studied at the laboratory. Types of energy dissipators described included the Morris-Johnson, Wisconsin notch spillway and the dissipator developed for the Whiting NAS for straight drop spillways, the SAF stilling basin for drop inlet and chute spillways and the box inlet drop spillway outlet. The hydraulics of drop inlet spillways was also explained. Free use was made of moving pictures to show the performance of several structures. In addition, several operating models were inserted in the laboratory demonstration channel so the men could see how the structures looked with water flowing over or through them. Both good and poor designs were demonstrated. We feel that this method of demonstrating the performance was most effective. The group was conducted through the laboratory so they could observe models of the structures currently under investigation as well as the work being conducted by other organizations and by the laboratory staff. Mr. Moratz cooperated throughout the conference by describing the field application of our work. We were left with the feeling that the conference was well worth-while. Twenty-three man days were spent in preparing for and during the conference. Further conferences should require much less time on our part.

"Our principal efforts during the month were concentrated on the model studies of channel junctions for the Whiting Naval Air Station. Mr. Bowers and a crew of mechanics were able to complete the model of the Owens Court junction with C-ditch (structure C-4) and place it in operation by November 26. Little information had been obtained by the end of the month. Nevertheless, the first operation showed that very high waves were caused at the junction, and that the waves would overtop the sidewalls by 5 feet. Several methods of improving the flow distribution in the downstream channel have been suggested. Particular emphasis is being placed on the following methods: (1) vertical sidewalls in the vicinity of junction, (2) counter disturbances set up by baffles upstream of the junction to cancel out the disturbance caused by flow from lateral, and (3) structures to bring the flow of the lateral parallel to that of the main stream before the two streams are joined. Modifications are now being made to the original design to permit an evaluation of these suggested methods of improving flow distribution. It is our intention to test briefly each method suggested and subsequently run a complete series of tests on that method or methods which show promise."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"During this period the following experiments were performed:

Channel	Experiment	Cover	No. of Flows
FC4	5	Medium length green Bermuda	8
U8	2	Andropogon Ternarius	15

"Channel FC4 is a waste channel. It receives no particular maintenance other than occasional marring to control weeds. It has been tested every fall since 1944. The tests reported here are the fifth set of tests.

"One of the most interesting things about this channel is the change in the species of grass occupying it. At one time it was nearly entirely Bermuda grass. Today the cover is about one-third Bermuda grass, one-third crab grass, and the balance consists of triple awn, broom sedge, silver beard, and misellaneous annuals. The average density of all species combined is 250 stems per square foot, a fair cover.

"The maximum velocity reached in this experiment was 4.1 feet per second. The channel was still in good condition after the tests except for some slight scour around the clumps of the various bluestems in the channel. The estimated permissible velocity for the channel is between 5 and 6 feet per second.

"The retardance of this vegetation was class C. The grass averaged 9 inches in length. However, the height of grass was not uniform. It ranged from 4 inches to 31 inches. A comparison of the retardance characteristic for all experiments is given in the following table.

VR	Manning's n				
	1948	1947	1946	1945	1944
0.065	0.35	0.31	0.24	0.24	--
.111	.37	.34	.23	.22	.18
.243	.21	.21	.15	.14	.13
.474	.13	.13	.096	.095	.094
.844	.092	.090	.073	.072	.074
1.48	.070	.066	.055	.054	.058
2.42	.054	.053	.045	.045	.050
3.45	.049	.045	.040	.039	--

"A study of the table shows that the retardance characteristics had changed but slightly since 1947.

"The principal construction work accomplished during this period was the rough grading of the block D channels. This block of six channels 200 feet long, 20 feet wide, and with the test reach on an 8 percent slope. Excavation of the forebay for this group was also started."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall for the month has been extremely low as will be noted from the records of the gages scattered throughout the area.

Location-Gage	November 1948	November 1947	November 1946
Mowry & Redland	.51	4.15	3.95
Sub-Tropical Expt. Sta.	.93	3.78	4.18
Gossman & Redland	.37	3.78	2.20
Plummer & Comfort	.64	No record	No record
Peters, Fla.	.41	4.37	8.73
Princeton, Fla.	.44	3.70	3.24
Cooper	.50	2.62	3.43
W-Mowry	.70	5.25	No record
E-33	T	3.52	1.86
Roberts & Avocado	.85	3.32	3.71
Jeran Grove	.71	No record	No record

"It will be noted from the above records that rainfall has been much lower for November 1948 than it has been for the past several years. As a result we have had a rather heavy decline in our water tables during this period. For the Redland profile losses in our water table varied from 0.84 foot at Highlands to 1.84 feet at the corner of Epmore and Redland (one-half mile north of the Station) to 0.49 foot at the north end of the line.

"Losses on the Mowry Street profile ranged from 1.05 to 1.48 feet, the greatest loss occurring in about the center of the area. For the Eureka profile losses ranged from 0.71 foot at Well #13 west of Redland Road, to 2.01 feet at about the center of this profile, and a loss of 1.75 feet in the vicinity of Peters, Fla.

"Losses in our water table were much higher in the central and northeastern portion of the area than along the coast.

"Losses for the month of November a year ago were somewhat less than for the present month. While we had in this area last year a greater amount of rainfall we also had high tides which helped retard the outflow of water from this area.

"Daily losses in our water table during the month were quite low varying from 0.02 to 0.05 foot per day. I believe from the data we have to the present time that we do have a recharge effect by the water to the northwest of this area.

"Readings on Well #5 located at the corner of Mowry and Redland Road for November 30, 1948, were 3.15 feet MSL; November 30, 1947, 1.93 feet MSL; November 30, 1946, 3.10 feet MSL, and November 30, 1945, 3.95 feet MSL.

"During this period of low rainfall there has been a more or less steady increase in the readings for the mulch plots, the greatest of course occurring in the check and natural cover plots, with the least in the shavings plot. The order at the end of this period being check, natural cover, pine straw, grass, and shavings. While after a period of dry weather it takes a longer period for the moisture under shavings to build up, this material will retain moisture over a longer period of time.

"Along with this study we have been running nitrogen rates on these plots for about a year. Our mulch plots were started in July 1947 and the first samples collected for nitrate analysis in September 1947. These readings became stabilized in December 1947 when the effect of old material had been dissipated. From that time to the present we have found that while we have very little release of nitrate in the shavings plot, on the grass and pine mulch areas the release of nitrates has at times gone to 30-40 ppm of nitrate. Indications are that in the case of shavings anaerobic conditions have been set up.

"There has been a definite increase in chloride concentration in the area a mile west of the structure (Military Canal). The cause of this is not known, and it will take time to find out why we get this increase. We had this same increase at about the same time last year. The indications are that the heavy pumping at the airport installation at the west end of this canal might be the cause. That is, this pump is in a deep rock canal and it may be that heavy pumpage has lowered the fresh water head in this area allowing the salt front to move inland. Parker's work has shown this to be true on the Florida City and North canals where there are like installations.

"In connection with our water control plot, this has been an unusual year. That is, we have had little or no rain since the storm of October 4, and as a result the whole area has dried up much faster than any year since this work has been in progress. As a result, although we were able to plow our area ten days to two weeks before any of the surrounding areas, one area to the East was plowed, or mud plowed ten days after we had plowed. There is no question that we cannot with a minimum of pumpage control the water within our area. The question now revolves around tillage methods, proper plowing, cover crops and bedding to facilitate the removal of water. We hope to rebed our original area and bed the remainder of the area this winter."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.- "Mr. Turner is developing a paper dealing with the use of fiducial limits when reporting soil permeability index numbers. This paper was originally prepared purely from a statistical point of view. It is now being redeveloped in a form that will be suitable for use by field technicians dealing with soil permeability work."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Ga.- "Climatic data: Rainfall dominated the scene during November, with precipitation being recorded on 12 separate days distributed throughout the month. The total rainfall for the month measured at the irrigation plots was 16.22 inches, 13.49 inches above the long-time average of 2.73 inches and nearly double the all-time high record of 8.78 inches for Athens, Georgia, also measured at the irrigation plots in 1947.

"Of especial note was the precipitation near the end of the month. The rainfall charts showed:

2:30 PM 11/26 to 1:00 AM 11/27	= 4.67"	Slow rate
1:45 AM 11/28 to 3:45 PM 11/28	= 3.95"	Slow rate
Total in 49 hours	= 8.62"	

"The river at the plot site reached high flood stage. All plots were submerged with flood water, some with as much as 12 feet.

"John R. Carreker gave a paper, 'Supplemental Irrigation in the Southeast,' November 10 at the meeting of the Southeast Electric Exchange in Atlanta."

Supplemental Irrigation Studies - James Turnbull, Lake Alfred, Florida.-"The drought, which started early in October, continued through November. The experimental plots at Haines City received their second irrigation of the season, while the plots at the Experiment Station received their third irrigation of the season.

"Some of the Hamlin orange trees on the Experiment Station plots were picked and the fruit run through the packing house. The yield from the irrigated trees was greater than the yield from the unirrigated trees with the increased yield due both to a greater number of fruit per tree and to fruit of larger size on the irrigated plots.

"The irrigated trees averaged 5.38 boxes per tree or 1,078 fruit per tree. The unirrigated trees averaged 4.79 boxes per tree or 957 fruit per tree. Of the fruit from the irrigated trees, 16.1 percent was size 288 or smaller and 56.8 percent was size 250 or smaller. Of the fruit from unirrigated trees 24.9 percent was size 288 or smaller and 68.9 percent was size 250 and smaller. Size restrictions are changed frequently

but quite often size 288 and smaller cannot be shipped as fresh fruit and occasionally size 250 and smaller are restricted from fresh fruit channels. Since fresh fruit generally brings considerably higher prices than cannery fruit there is a marked advantage to producing fruit which is large enough to ship as fresh fruit.

"Only 1.4 percent of the irrigated fruit was larger than is generally shipped and 0.8 percent of the unirrigated fruit was larger than is generally shipped.

"These figures are from only a portion of the crop from the experimental plots and more complete data will be obtained when the balance of the crop is picked."

IRRIGATION DIVISION

Drainage Studies.-Work on Project R-3-5-1, Utah-R-3, Plan 2, The Activities and Needs of Utah Drainage Districts, has been completed and a bulletin containing the results of this work is now at press. In this study, extending over a two-year period, the project leaders, J. Howard Maughan, O. W. Israelsen and E. G. Hansen, made a survey of 39 drainage districts of Utah which included a study of the institutional and financial aspects of drainage districts, and a study of the drainage systems, their design, construction, operation and maintenance, and the results of drainage on land reclamation. A report of this project is being published in Utah Agricultural Experiment Station Bulletin 335, Drainage Districts of Utah, Their Activities and Needs.

Management of Related Irrigation and Drainage Enterprises.-This study of drainage districts together with the earlier companion study of irrigation companies has demonstrated the need for strengthening small irrigation companies by consolidating them, where feasible, and giving authority to them to take care of both irrigation and drainage requirements. Consequently a new project, entitled Management of Related Irrigation and Drainage Enterprises was organized to assemble information concerning the activities, economy and needs of related irrigation companies and drainage districts, and on the basis of these studies to make recommendations for sound, workable improvements.

Canal Lining.-C. W. Lauritzen reports construction work in connection with the field test at Richmond was completed. Only the master joint sealer remains to be installed in the section of precast shales. This will be installed with a special gun which has not yet arrived. Winter set in early this year and the low temperatures made it necessary to turn the water out of the channels at the River Laboratory on November 26.

Idaho - Morlan Nelson.-A special report was prepared outlining in detail the uses made of snow survey data and streamflow forecasts. This report was sent to R. A. Work who consolidated it with similar reports from other areas and submitted the consolidated report to the Hydrology Sub-Committee of the Columbia River Basin Inter-Agency Committee.

A three-day conference was held in Boise to correlate the work of the Boise, Idaho; Bozeman, Montana and Medford, Oregon offices in connection with the issuing of the over-all Columbia Basin Snow Survey and Water Supply monthly reports. At this conference all of the forecast curves and the pertinent data used in forecasting Montana streams was turned over to Mr. Codd for his use at Bozeman. In the future Mr. Codd will

receive and interpret all of the snow survey data obtained in Montana and make streamflow forecasts for all streams within the State of Montana. His forecasts will be sent to Boise for inclusion in the Columbia Basin report.

Oregon - R. A. Work and W. T. Frost.-R. A. Work spent the better part of a week in Boise with W. D. Criddle, A. R. Codd, Morland Nelson and Sterling Davis, in final review of plans for transfer to supervision of A. R. Codd of snow surveys in Montana, west of the Continental Divide. Details were agreed upon as to format of 1947-48 snow survey reports for Columbia Basin and Montana. It developed here that USWB declines to furnish to SCS in the future, data of precipitation prior to the 20th of each month following any one precipitation month. This seems to mean that SCS snow survey reports will not be able to include precipitation data since snow survey reports are issued as of the 9th of each winter month. An effort will be made to encourage the Weather Bureau to revise its stand on this. If this effort is not fruitful some other means may have to be adopted to secure precipitation data where such data are used in conjunction with snow surveys to forecast runoff.

Arizona.-Karl Harris accompanied by Joel Fletcher made a field trip through Texas discussing irrigation and soils problems with Operations personnel. Harris prepared a brief report of his trip with comments regarding irrigation and soil management practices. Copies of this report were sent to the State Conservationist and the Regional Conservator. Harris spent four days discussing irrigation problems and furnishing information to Extension workers.

California.-Wells Hutchins rendered special assistance to Oklahoma and Idaho through council and advice relative to the preparation of ground water laws in those states. Mr. Hutchins attended the National Reclamation Association conference in Oklahoma City where his council was sought by various states having problems relating to irrigation laws.

For two years the Research Division (V. S. Aronovici) has been cooperating with the technicians in the Yucaipa Valley Soil Conservation District. Aronovici reports:

"As a result of long-continued overdraft on the underground basins, the water supply in Yucaipa Valley Soil Conservation District has become critical. In an effort to conserve water, the Soil Conservation Service has recommended a shift from irrigating on a 21-day schedule with application of about 2-1/2 acre-inches per acre on all of the orchard to a 14-day irrigation schedule with an application of approximately 1.5 acre-inches per acre, or a 28-day schedule with an application of 3 acre-inches per acre on half the orchard (alternate furrows). It was felt

that better irrigation efficiency would result and better moisture condition might be maintained in the main root zone. As a result of this recommendation, a large number of farmers, members of the three principal water companies, shifted to this schedule.

"Two locations were selected for study. The first was the Beaumont Fruit Company Orchard of Rio Oso Gem Peaches, situated two miles east of Yucaipa. Fruit measurements were conducted simultaneously with consumptive use measurement. This provided an excellent opportunity to compare fruit growth with soil moisture conditions. This property was on a 14-day irrigation schedule. A comparison of fruit growth on a 14-day and 28-day irrigation schedule was made on the Ivy and Wisham Orchards of Sims Peaches, located about three miles southwest of Yucaipa.

"The mean maximum diameter of a peach, when measured at right angles to the sutures gives a very excellent index of fruit volume throughout the growing season. At no time during observations on all orchards was there observed a distinct period of severe moisture stress. Previous studies of lemons and pears indicated that when severe moisture stress develops, fruit growth stops. The application of this technique to determine the relative merits of 14 and 28-day irrigation intervals upon fruit growth suggests the greater value of the 14-day interval. Sufficient evidence was secured to suggest the vital part water plays upon fruit sizes and production and the real need for further study along this line.

Research - Stephen J. Mech, Prosser, Washington.-Routine computation of the current year's data is being continued as time permits. The potato plots have been harvested and graded for size and shape. The following table summarizes these data:

Plot Description	Nominal Available Soil Moisture Range	Irrigations During Growing Season	Yield		
			Total	No. 1's	No. 2's
	Percent	Number	Tons/A	Tons/A	Tons/A
Dry	35 - 100	2	8.1	4.0	4.0
Medium	60 - 100	4	8.8	4.8	3.8
Wet	75 - 100	8	8.7	4.5	4.0

The following observations have been made. Fusarium wilt was present on all plots and undoubtedly affected the total yield. Wireworm damage was greatest on the "wet" plots and least on the "dry" plots. Tubers were smallest on the "dry" plots. They were somewhat pear shaped - elongated at the stem end.

The best shaped tubers were found on the medium plots. These were produced with four irrigations spaced at approximately two week intervals. (Irrigations were determined not by the calendar but by soil moisture determinations.)

It may be concluded from the above table that maintaining the available soil moisture range between 60 - 100 percent yields as well as the wet plots and better than the plots where the moisture range was 40 - 100 percent. The commonly prevailing practice is to maintain a high soil moisture content in the root zone after the potatoes have bloomed. This means almost continuance irrigation on some fields. It is claimed that a high moisture content is necessary for quality tubers. This season's results did not substantiate these commonly held beliefs.

This seems to indicate that for the ranges usually experienced in potatoe production the influence of soil moisture on yield and quality is still debatable. Apparently factors other than soil moisture enter into the picture.

Irrigation Practices and Consumptive Use of Water - Paul A. Ewing.- Principal activities were represented by cooperative effort, with H. F. Blaney, to wind up the Pajaro report and to initiate similar studies in Lake County. Extension of the Pajaro studies for another year resulted in decision to confine our pending report to recital of progress. This plan was carried out, and the progress report, following the lines of the 1946 report of the Salinas Valley investigation, is now being typed.

Spreading Water - San Joaquin Valley - A. T. Mitchelson, Dean C. Muckel, Hayden K. Rouse, Eldred Bliss, Curtis Johnson.-Operation of the inner buffer pond at the Wasco field was continued throughout November. There appeared to be no significant change in the trend of the curve of rate for the inner pond when the water was turned off from the outer pond. In comparing the total amount of water percolating for two runs, a lack of consistency was noted. During the 28 days of the present run, 110 feet percolated in the inner pond as compared to 128 feet during the first 28 days of the first run, a decrease of 14.2 percent. During the same periods in the outer (annular) pond, percolation was 94 feet as compared with 80 feet in the first run, an increase of 17.4 percent.

Microscopic examination of the water in the inner buffer pond at Wasco was continued. Since the outer pond was shut off, there has been an increase in the number of protozoa in the inner pond and a decrease in the filamentous type of algae which had previously flourished there.

November 8 and 9 a field trip was made to San Joaquin Valley for the purpose of selecting one of several suggested experimental spreading areas on the Kaweah Delta in the Tulare Basin. The areas suggested ranged in area from 5 to 160 acres and differed somewhat in soil and

topography and in water supply accessibility. The areas had been previously used for spreading in times of floods and had also been considered by the combined technical staffs of the Tulare Irrigation District and the Kaweah Water Conservation District as possible sites from which the Division might select a suitable area for future experimental spreading on an enlarged scale. After a field inspection by members of this Division and the local engineer of the Bureau of Reclamation, an area of about 10 acres of the southeast corner of the conservation district's area No. 3 was selected. After the field trip, a meeting was held in the office of the Water Conservation District with members of their Board of Directors and their attorney and consulting engineer. Our plan was presented, accentuating the use of cotton boll hulls, the need for a constant and controlled water supply, etc. The extent of the cooperation of both the Bureau of Reclamation and this Division was explained and numerous questions from the several members of the technical staff answered. The Board seemed very anxious to enter into cooperation and were grateful for our interest in their problem. A meeting of the Board is to be held in Visalia on December 7, and we have been invited to hear their decision at that time. Arrangements will be made to take the entire cotton boll hull supply of one of the nearby cotton gins.

The site we selected, which was approved by the Directors, will probably require us to reduce the anticipated magnitude of the experimental areas to about 3 acres each -- one to be maintained as a check area, the other to receive a liberal supply of cotton bolls disked in.

Irrigation Enterprise Organizations - Wells A. Hutchins.-The progress report of this study was completed. It is entitled "A Study of the Adaptability of Various Types of Irrigation Enterprise Organizations to Conditions Prevailing in Certain of the 17 Western States," by Wells A. Hutchins, SCS, H. E. Selby, BAE, and Stanely W. Voelker, BAE. It was prepared under a cooperative agreement between the Soil Conservation Service and the Bureau of Agricultural Economics. The progress report, dated October 1948, was submitted in November to the heads of the cooperating agencies -- George D. Clyde, Chief, Division of Irrigation and Water Conservation, SCS, and V. Webster Johnson, Head, Division of Land Economics, BAE.

The mimeographed report contains 182 pages, in four parts:

I. Purpose and scope of study. This relates the importance of irrigation organizations, purpose of the study, terminology used, types of irrigation enterprise organizations, and enterprise organizations selected for the study. Fifty-three enterprises were canvassed in 16 States -- all of the 17 Western States except Oklahoma. For the 53 enterprises

there were 55 organizations, because two enterprises had both mutual-company and district organizations. The organizations comprised 24 irrigation districts, 4 districts of other types, 17 mutual irrigation companies, and 10 commercial irrigation companies.

II. Characteristics of selected irrigation enterprises of various types. This relates, for the enterprises within the type-groups, their purposes of organizing, agriculture, water supply, water service, capital, revenue, and management.

III. Success or failure of irrigation enterprises. This relates the meaning of success or failure, factors influencing financial success or failure, relation of type of organization to success or failure, and factors related to the value of irrigation water. It is brought out that the significant point in determining financial success or failure is the cost of the water to the users in relation to the amount of benefits obtained from the water; and that the cost-benefit ratio for a given project is more or less variable over a period of years because the benefit from water ordinarily is subject to greater change than the cost. The success or failure of an irrigation enterprise appears to depend primarily on factors other than mere type of organization. The type of organization, of itself, has been responsible in probably few instances for the success or failure of the project. However, the type of organization may have an important relation to the degree of success or failure because of relative advantages and disadvantages of the various types under various circumstances.

IV. Advantages and disadvantages of types of irrigation organizations. This relates the advantages and disadvantages of the several types of organizations in some detail in the more important particulars, and in general with respect to a few other points. The more important topics under which comparisons are made are organizational procedure, financing, revenue, allocations of water privileges, inclusion of land in irrigation projects, exclusion of land from irrigation projects, exemptions from taxation (Federal and State), and attitude of the water users. Some fundamental differences are noted under these topics. The minor topics are public supervision over the activities of irrigation enterprises, eminent domain, overhead, and availability of public records.

Also included in Part IV is a discussion of the probable results if the enterprises studied had been under some other type of organization. The irrigation districts and mutual companies in the study appeared to be generally well adapted to the circumstances under which they were being used. Only one of the irrigation districts appeared to be actually

unsuited to its environment. The commercial companies, on the whole, were less suited to their conditions than were the other enterprises, and in several cases it appeared that a different type of organization would have been preferable.

The report also includes a comprehensive summary and conclusions, set up by topics. An appendix lists the 55 irrigation organizations included in the study.

This report was prepared for in-service use only, and not for publication. It is planned later to prepare for publication a bulletin correlating the results of this study with those of other studies of irrigation organizations. Some such correlation exists in the present work, but it can be extended with good results.

Well Screen Performance Tests - Carl Rohwer.-Tests of the hydraulic properties of 18-inch punched screens with 1/16, 1/8 and 3/16-inch perforations were completed by Gilbert Corey. A very marked spiral flow occurred in these screens which was not observed in tests made on other screens. A metal partition was installed in the screens which divided the screens in half longitudinally. This partition stopped the spiral flow and made it possible to get more accurate readings of the loss of head.

A set of well screens covered with 12, 18 and 20-inch wire gauze was manufactured for us by one of the cooperating companies. Arrangements were made with a local gravel company to screen the 1, 1/2, 1/4 and 1/8-inch gravel required for the tests of gravel envelopes. Material has been obtained and construction started on the bins for storing the gravel at the laboratory.

Sprinkler Irrigation Studies - W. D. Criddle, Boise, Idaho.-During the month a project work plan was completed and sent to the Idaho Agricultural Experiment Station and the U. S. Bureau of Reclamation for suggestions and approval in a cooperative study within the State of Idaho. Also work was begun on compiling economical data, power rates, soils data, and information on new sprinkler equipment and research work now underway in the sprinkler field. All of these data are essential in properly designing or recommending sprinkler systems in the area.

Field investigation was begun on existing systems throughout the State of Idaho. Mr. Pair made a field trip to Idaho Falls in eastern Idaho and to Coeur d' Alene in northern Idaho. On each of these trips he stopped and talked to anyone who had had anything to do with design or installation of sprinkler equipment and succeeded in obtaining a substantial amount of practical information on sprinklers in the State of Idaho.

Cooperative Consumptive Use Studies in Utah.-During the past month our Mr. Davis and some W.A.E. help have been determining areas on the land use classifications made for consumptive use purposes in the Ferron and Ashley Valleys of Utah. Practically all of the areas have been computed for the Ferron Creek Area and about one-half of those in the Ashley Valley. A progress report outline was prepared and sent to the Utah Agricultural Experiment Station for criticism and suggestions. A conference was held with the U. S. Geological Survey both Ground Water and Surface Water Divisions to determine when stream flow and groundwater records will be available for the two areas. It was decided that a completion of the studies and a progress report will be prepared on the past year's investigations as soon after the middle of January as possible dependant upon the obtaining of the results from the U. S. Geological Survey.

Silt Studies - Dean W. Bloodgood, Austin, Texas.-All silt data for September have been completed, tabulated, and copies mailed to various cooperators. Some of the Texas streams continue to be at low-water stage, and a number of them are dry, with the exception of water holes. The water samples received at the laboratory contain little or no silt. River discharge records prepared by the U. S. Geological Survey are being made available for silt determinations sooner than for former years, on account of the scarcity of water in the stream channels from two years of drought.

During the month we received two US-DH-48 type of silt samplers from the Corps of Engineers, U. S. Army, which we plan to test in conjunction with the sampler we are now using in silt sampling.

Water Requirements in Soil Conservation Districts - Harry F. Blaney, Los Angeles, Calif.-"A progress report on consumptive water requirements studies for 1947-1948 in the Pajaro and Elkhorn Soil Conservation Districts in Santa Cruz County was completed. This project is being conducted in cooperation with the State Engineer of California, the Soil Conservation Districts and Operations Work Group. Tentative values of consumptive water requirements under normal irrigation and climatic conditions in Pajaro Valley for typical irrigated crops are shown in the following tabulation.

Crop	Rates of consumptive use of water: Winter (November 1 to March 31)	Irrigation season (April 1 to Oct. 31)	Annual	
	Inches	Inches	Inches	Feet
Alfalfa	9.0	28.7	37.7	3.14
Beans	8.0	10.0	18.0	1.50
Berries (bush)	8.0	10.0	18.0	1.50
Lettuce - 2 crops	8.0	13.2	21.2	1.77
Pasture	9.0	24.0	33.0	2.75
Sugar beets	10.0	11.5	21.5	1.79
Tomatoes	10.0	11.5	21.5	1.79
Truck	10.0	10.0	20.0	1.67

San Fernando Valley Investigation - William W. Donnan, Los Angeles, Calif.- "Work has continued in obtaining soil samples for fall moisture deficiency. About 424 samples have been secured on citrus, walnuts, beans, tomatoes, squash, alfalfa and grain hay crops. We are waiting for a small amount of rain before sampling the brush, weeds and grass areas. Data are being compiled on acreage of irrigated crops for four different rainfall years during the past 20 years. From the Los Angeles Bureau of Water and Power records of water applied by months for these crops have been obtained. Marvin Litz reported for duty on October 31 and has been assisting with this study."

Imperial Valley Irrigation Study - George B. Bradshaw, Imperial, Calif.- "Sprinkler irrigation is being tested at two locations on the Imperial East Mesa. One location is sprinkling 24 acres and the other approximately 160 acres. The soils are predominantly Rositas fine sand, low dune phase and dune sand, Rositas soil material.

"Last spring an attempt was made to irrigate 15 rows of black-eyed cow peas by furrow irrigation on the 160-acre tract. This attempt met with failure because of the steep slopes which caused excessive erosion and the quarter-mile length of runs. With this length of run, it took three to six men 14 days to finish the first irrigation. At the present time the 160-acre tract is being irrigated with sprinklers. There are 66 sprinkler heads working from a 1,980-foot, six-inch line. The tract has been planted to both flax and alfalfa, and the first irrigation accomplished. This 160-acre tract should be a good indication as to the feasibility of sprinkler irrigation on the Imperial mesas."

Upper Santa Ana River Study - Dean C. Muckel, Pomona, Calif.-"Soil sampling for fall moisture deficiencies in the Yucaipa-Beaumont area was completed during the month. Samples were taken at 21 locations differing either as to soils or crops.

"Consumptive studies carried on in a mature peach orchard during the regularly scheduled irrigation season just completed, resulted in the following:

Depth	Seasonal use 7-26 to 9-24	Ratio to total considering 4-foot root zone	Ratio to total considering 8-foot root zone
Feet	Inches	Percent	Percent
0-1	7.79	58.3	49.7
1-2	2.84	21.3	18.1
2-3	1.45	10.8	9.3
3-4	1.28	9.6	8.2
	13.36	100.0	
4-5	1.07	-	6.8
5-6	1.23	-	7.9
	15.56	-	100.0

"A total of 18.40 acre-inches per acre was applied to this orchard in 10 irrigations."

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